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# A Study of Prehistoric Utilization of the Inter-Riverine Piedmont: The U.S. 176 By-Pass Survey from Union to Pacolet, South Carolina

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# A Study of Prehistoric Utilization of the Inter-Riverine Piedmont: The U.S. 176 By-Pass Survey from Union to Pacolet, South Carolina

**Keywords**

Excavations, Union, Pacolet, Union County, Piedmont, South Carolina, Archeology

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*A STUDY OF PREHISTORIC UTILIZATION OF THE INTER-  
RIVERINE PIEDMONT: THE U.S. 176 BY-PASS SURVEY  
FROM UNION TO PACOLET, SOUTH CAROLINA*

*by*

*John S. Cable, Charles E. Cantley, and*

*Jim S. Sexton*

*Research Manuscript Series No. 131*

The University of South Carolina offers equal opportunity in its employment, admissions, and educational activities, in accordance with Title IX, Section 504 of the Rehabilitation Act of 1973 and other civil rights laws.

Prepared by the  
INSTITUTE OF ARCHEOLOGY AND ANTHROPOLOGY  
UNIVERSITY OF SOUTH CAROLINA  
June 1978

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## MANAGEMENT SUMMARY AND RECOMMENDATIONS

Under the 1978 agreement between the South Carolina Department of Highways and Public Transportation, members of the highway archeology staff (John Cable, Charles Cantley, and Jim Sexton) of the Institute of Archeology and Anthropology, University of South Carolina, conducted an archeological survey of the proposed U.S. 176 By-pass route. This survey was performed in compliance with the National Environmental Policy Act of 1969 (NEPA) and Executive Order 11593.

The project is situated in northwestern South Carolina and extends some 30 kilometers (19 miles) in length from Union to Pacolet. This area is located well within the Piedmont topographic province. The topography of the project corridor is dominated by well defined dendritic drainages with associated upland ridges. These drainages represent the higher rank order streams that flow into Fairforest Creek to the south.

The research design implemented by the authors called for a multi-phase survey strategy. Phase I was executed during the week of January 23, 1978, as a brief reconnaissance of selected areas within the proposed route. Phase II, an intensive survey of the entire highway corridor, was originally planned to survey 100% of the proposed route; however, this was not possible given present land use patterns and local topography. Due to these two factors and inclement weather, which drastically shortened the amount of time spent in the field, only 85% of the highway corridor was systematically examined. Phase II of the survey was conducted during the weeks of February 20, 27 and March 14, 1978. Data collection was performed in a manner so as to maximize the information recovered from each site concerning the hypotheses posed in the research design. Twenty-one sites were located during the survey of the U.S. 176 By-pass.

On March 23, 1978 a meeting was held between Michael Trinkley, staff archeologist for the South Carolina Department of Highways and Public Transportation, and John Cable and Charles Cantley of the Institute to discuss the importance of the archeological resources within the proposed U.S. 176 By-pass corridor. During this meeting, six sites (38UN27, 38UN28, 38UN49, 38UN50, 38UN51 and 38UN54) were identified as containing information important to on-going scientific research in South Carolina. It was determined that adverse impact of at least three of these sites (38UN49, 38UN50 and 38UN51) could be avoided by a slight adjustment of the present alignment of the corridor. In this case, the information potential of these sites can be preserved. However, the other three sites present a more complicated picture in the mitigation of adverse impact.

Michael Trinkley has advised that 38UN27 may be preserved by shifting the present highway alignment to miss the site. If this suggestion is consistent with the design constraints placed on highway routes, this alternative would appear to be the most desirable solution to the protection of the information contained in 38UN27. However, should this alternative

prove unfeasible with the accompanying result that the site becomes endangered by highway construction, it is the judgement of the authors of this report that an excavation program to properly recover information from 38UN27 be instigated by the Highway Department. Since it was impossible to recover information at the level required to plan excavation strategies at the site during the short amount of time allotted for the survey of the corridor, it is also suggested that an initial probing strategy be devised to direct full scale excavation.

The final two sites, 38UN28 and 38UN54, will be unavoidably impacted in an adverse manner by the construction of the U.S. 176 By-pass. Although the information contained in these sites is not intrinsically more important than that contained in the other four sites, the sheer volume of information present makes considerations of its conservation more difficult. In the meeting held with Michael Trinkley on March 23, 1978 it was determined that the alignment of the proposed corridor could be shifted so that only low artifact density areas of these two sites would be impacted by eventual construction activities. Trinkley has advised that salvage work be instigated in the construction rights-of-way of both sites to retrieve information valuable to scientific research in South Carolina. It is the opinion of the authors that salvage work should take the form of an excavation program directed towards answering questions posed in this report concerning the function of these two sites. It is later suggested that 38UN28 and 38UN54 exhibit properties that might indicate maintenance or base camp activities. Therefore, the most important information potentially contained in these sites concerns evidence of features (i.e. post molds, storage pits or house floor platforms) that would indicate permanent or semi-permanent occupation. This type of information is only retrievable by the excavation of a contiguous block of deposit. Thus, it is our considered opinion that proposed excavation programs for these two sites should be oriented toward exposing a certain amount of continuous horizontal space.

With the exception of the work suggested above, no further archeological investigation of the U.S. 176 By-pass route is deemed necessary prior to construction.

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## INTRODUCTION

Under the 1978 cooperative agreement between the South Carolina Department of Highways and Public Transportation, members of the highway archeology staff (John Cable, Charles Cantley and Jim Sexton) of the Institute of Archeology and Anthropology, University of South Carolina, conducted an archeological survey of the proposed U.S. 176 By-pass route. The proposed route extends some 31 kilometers (19 miles) in length from Union to Pacolet, South Carolina and generally parallels the existing U.S. 176 highway. The highway begins nearly a kilometer (.6 miles) northwest of Union where it will connect with the U.S. 176 By-pass around the town. The route then passes through rural Union and Spartanburg Counties by-passing Jonesville and Pacolet. Approximately one kilometer west of Pacolet, the proposed highway will connect with the existing U.S. 176 (Fig. 1).

During the week of January 23, 1978, the Institute of Archeology and Anthropology highway staff conducted an initial reconnaissance of the proposed U.S. 176 By-pass route to determine which survey strategies would prove most efficient and productive for the intensive survey of the project area. During the weeks of February 20, 27 and March 14, 1978, an intensive survey, covering approximately 85% of the proposed corridor was conducted. The laboratory analysis of the artifactual material recovered during the survey was performed by the highway archeology staff during the intervening weeks between fieldwork. The report that follows will discuss the results of the survey and offer recommendations for the management of cultural resources that may be adversely impacted by the construction of the proposed U.S. 176 By-pass route.





FIGURE 1

## ENVIRONMENTAL INFORMATION

### General Piedmont Environment

The proposed U.S. 176 By-pass route, extending from Union to Pacolet, South Carolina, is nearly 31 kilometers in length and roughly parallels the existing U.S. 176. The project corridor lies entirely within the southern Piedmont physiographic province in northwestern Union and eastern Spartanburg Counties.

The Piedmont of South Carolina is bordered on the east by the Fall Line, which separates the province from the Coastal Plain region. To the west, approximately 185-195 kilometers from the Fall Line, is the Blue Ridge province, marking the western boundary of the Piedmont. Elevations of the Piedmont range from 160 meters at the Fall Line to nearly 320 meters at the border of the Blue Ridge province. Trimble (1974: 9) describes the lower elevations of the Piedmont as being "characterized by broad interfluves with a large proportion of land in gentle slopes." In contrast, the higher elevations of the Piedmont exhibit greater relief, "the interfluves or ridges become narrower, and the proportion of land in gentle slopes decreases."

The Piedmont province is characterized by an intricately complex yet well defined dendritic drainage pattern. The uplands or interfluves of the area are heavily dissected by drainage lines and permanent or intermittent streams occupy nearly every depression within the region. The major drainage systems (e.g. the Catawba-Wateree, Broad and Saluda Rivers) flow through the Piedmont in a northwestern to southeastern direction, eventually crossing the Fall Line and entering the Coastal Plain.

The soils of the Piedmont are largely residual in origin with the exception of those distributed along floodplains where new alluvium is deposited nearly annually (Oosting 1942). Most of these soils were formed in regolith weathered from igneous and metamorphic bedrock such as granite, schist, and gneiss (Camp, et al. 1975). The physical and chemical properties of these soils are of a highly diversified nature as a result of their individual derivation. They are differentially distributed across the region such that there appears a mosaic of soil types varying in texture, fertility and pH throughout the area. These factors are of primary importance in determining the natural biotic resources of the South Carolina Piedmont and provide a fundamental source of variation within this region.

Braun (1950) describes the present, major vegetational pattern of the South Carolina Piedmont as oak-pine. Prehistorically, oak-hickory climax forests and other edaphic variants probably dominated the region,

but with the settlement of the Piedmont during the middle eighteenth century large tracts of land were cleared and put under cultivation by European settlers. Extensive cultivation of the uplands over the past 200 years, especially the cotton agriculture of the nineteenth century (cf. Trimble 1974), has altered the landscape such that there is today, little oak-hickory climax stage vegetation to be found in the Piedmont of South Carolina. The loss of this natural vegetation to agriculture and the negligence and mismanagement of these land use practices during Historic times have had a profound impact on the Piedmont. Gully erosion has carved deep ravines into the mantle of saprolite on the steep slopes of the Piedmont while topsoil displacement in the form of sheet erosion has altered the gentler slopes (Trimble 1974). So great was the damage incurred upon the Piedmont that Rowalt (1937) has attempted to measure it and suggests that 40% of the land in the South Carolina Piedmont has lost at least three-fourths of its topsoil.

The Piedmont of South Carolina has been included by Shelford (1963: 57) into the Oak-Hickory zone of the Southern Temperate Deciduous Forest Biome. This region hosts a variety of fauna and includes such species as squirrel, fox, raccoon, opossum, wolf, bobcat, skunk, black bear, white-tail deer, turkey and rabbit. Prehistorically these species were probably well represented throughout the Piedmont province and conceivably varied seasonally between microenvironmental zones much as they do today. In addition to the terrestrial species mentioned above the rivers support aquatic resources such as fish, waterfowl and shellfish.

#### Local Environmental Setting

Elevations in the immediate vicinity of the proposed U.S. 176 highway corridor range from approximately 190 meters near Union to 225 meters above sea level south of Pacolet. The existing U.S. 176 is situated on a ridgetop that extends the distance of the highway between Union and Pacolet and is east of the proposed corridor. The proposed route parallels the existing 176 but instead of following the ridgetop, this corridor will transect several ridge fingers that branch from the body of the main ridgetop. As a result, relief is great in the immediate project corridor as the route passes the interval drainage lines that occupy the depressions between the ridge fingers.

The streams that occupy the depressions between the ridge fingers of the proposed corridor are permanent, low ranking (Strahler 1964) streams that generally flow southward. The highway corridor intersects each of these streams: Buffalo Creek, Rocky Creek, Swink Creek, Bishop Branch, Spear Creek, and Cunningham Creek. All of these streams empty into Fairforest Creek (probably a rank 2 drainage), which itself enters the Tyger River (rank 3 or 4). The Tyger flows into the Enoree River (rank 4 or 5) several kilometers before the Enoree enters into the Broad River (rank 5 or 6). The streams on the opposite side of the ridgetop from the proposed corridor, all enter into the Pacolet River (rank 4 or 5) which is a major tributary of the Broad River as well. Thus, the existing U.S. 176 is situated on the main ridgetop which

divides the Pacolet and Tyger-Enoree drainages before each enters into the Broad River. The Broad River at its closest point, due east of the project area, is some 15 kilometers distant. These topographic conditions meet the criteria established by House (cf. House and Ballenger 1976) for the inter-riverine zone of the Piedmont and contrast with the floodplain habitats typical of the riverine zones along major drainages in the Piedmont.

The soils of the project vicinity have been adequately described by Camp, et al. (1975). Their map of Union County shows three general soil associations that intersect or are immediately adjacent to the proposed corridor: 1) nearly level soils usually on floodplains, Enoree-Chewacla-Wehadkee association; 2) strongly to steeply sloping soils usually on the uplands, Madison-Pacolet-Cecil association, Madison-Pacolet-Louisburg association and Wilkes-Pacolet-Enon association; and 3) gently to strongly sloping soils, usually on the uplands, Hiwassee-Cecil association and Madison-Cecil association.

The strong to steeply sloping soils of the uplands support vegetation such as oak, hickory, pine, elm, gum, maple, and an understory of vines, briars and grasses. The gently to strongly sloping soils of the uplands are characterized by oak, hickory, dogwood, sourwood, holly, red cedar, and an understory of shrubs, vines, briars, and grasses. The nearly level soils found along the floodplains of drainages support gum, water oak, ash, elm, alder, willow, cottonwood, poplar, birch, sycamore, and an understory of vines, briars, wetland grasses and reeds (Camp, et al. 1975).

Camp, et al. (1975) divide the fauna that occupy this region into woodland, openland, and wetland species and then rate them according to their potential for inhabiting particular microenvironmental zones. Their ratings range from well suited, suited, poorly suited to unsuited. Woodland species are squirrel, woodcock, raccoon, deer, and wild turkey. Openland species are quail, dove, rabbit, and fox. Wetland wildlife are ducks, geese, heron, and minks. The following listing is adapted from Camp, et al. (1975) and displays the suitability of different faunal groups to the three general soil associations.

Soil Associations	<u>Woodland</u>	<u>Openland</u>	<u>Wetland</u>
A) Gently to Strongly Sloping	3-4	2-3	1
B) Strongly to Steep Sloping	1-3	1-2	1
C) Nearly Level	4	1-2	3

1) Unsuited; 2) Poorly Suited; 3) Suited; and 4) Well Suited

House and Ballenger (1976) distinguish two major environmental zones within the Piedmont of South Carolina: the riverine zone and the inter-riverine zone. The gross environmental criteria established by these investigators for the inter-riverine zone are met by the U.S. 176 By-pass survey area. However, within the U.S. 176 survey area there exists considerable variation in this inter-riverine zone such that micro-environmental zones can be differentiated and the differences deemed significant. Conceivably these environmental differences, however subtle, may create contrastive adaptive strategies and generate implications for the demographic arrangement and settlement patterning of aboriginal populations.

## METHODOLOGY

### Records Check

Prior to the beginning of fieldwork, a records check of the Statewide Archeological Inventory in Union and Spartanburg Counties at the Institute of Archeology and Anthropology was conducted. This was done to determine if archeological sites were previously recorded in the study area and, if so, to further investigate these sites during the present survey. Although thirteen sites had been recorded by Most (1977) north of Spartanburg, no sites were found in the immediate project vicinity.

### Phase I: Initial Reconnaissance

Due to the absence of archeological information pertaining to the project vicinity, the Phase I strategy of the 176 By-pass survey was designed to conduct an initial reconnaissance of areas of "high probability" for locating archeological sites. Given the limited amount of time allotted for completion of Phase I, it was believed that a search of these areas would provide the greatest opportunity for discovering sites in the proposed highway corridor. The definition of these "high probability" areas was based on a literature search of Piedmont archeological reports (Goodyear 1978; House and Ballenger 1976; Most 1977) and by observing which geographical variables noted in those reports correlated with site locations. Immediately obvious to the authors were the limitations of such a methodology. Individuals conducting archeological research often use sampling methods in an attempt to collect data relevant to their own research questions and interests. Frequently, archeological research is limited geographically by contract project areas. A macroscopic view of the Piedmont may give the impression of a homogeneous environment; however, a microscopic view allows one to observe a myriad of varying environmental zones. This means that previous research conducted in the Piedmont cannot be assumed to have taken place in microenvironmentally similar areas, thus it may not be directly comparable. Considerable variations also exist in data collection techniques and sampling schemes employed by researchers working within the Piedmont physiographic province.

Consequently, three variables were chosen which intuitively correlated with site location. These were high knolls on ridge tops, ridge fingers, and headwaters of tributaries. "High probability" areas within the proposed 176 By-pass were subsequently selected according to these three variables. Phase I of the survey was conducted between January 23-27, 1978.

## Phase II: An Intensive Survey of the Proposed Highway Corridor

The main objective of Phase II of the U.S. Highway 176 By-pass survey was to conduct a systematic field inspection of the proposed corridor to locate and identify all archeological sites.

The fieldwork was allotted 14 work days and the method chosen for survey consisted of walking the entire 100 meter-wide corridor of the proposed route while inspecting the ground for artifacts. However, difficulties occurred, which prohibited a 100% coverage of the route.

### *Data Categories and Collection Techniques*

In conducting both phases of the survey, it was revealed that information concerning certain data categories needed to be investigated. These were:

1. Locational patterning of archeological sites in relation to topography and soils of the area surveyed;
2. Estimation of site size;
3. Density estimates of artifacts present at each site;
4. Tool diversity at each site;
5. Factors influencing the reuse of sites through time (i.e. multicomponent sites).

These five data categories were beneficial in structuring the collection techniques employed during the actual fieldwork. The collection technique found most useful for providing relevant information pertaining to the five categories was the controlled collection of a site. Goodyear (1978: 9) describes this procedure as:

... collecting all visible items of material culture from the ground surface regardless of size. Such items as tiny debitage fragments and pieces of fire cracked rock which are often ignored in traditional collecting methods were also consciously collected. The intent was to minimize sampling bias related to the selective collection of artifacts by size and class. 'Control', therefore, simply refers to eliminating human bias as much as possible in terms of what is collected, thereby promoting a more representative sample of material culture content from the site.

The use of the controlled collection on the 176 By-pass survey not only provided a body of data amenable to various forms of quantitative analyses but also established a comparable data base with sites recorded by different researchers utilizing the same collection technique.

Subsurface testing was employed during Phase II of the survey to augment the information obtained from the surface collection. This consisted of digging a series of small 30 cm square shovel holes spaced at regular intervals across the site. The backdirt was then screened through a  $\frac{1}{4}$  inch mesh sifter. This procedure was implemented to obtain data on the local soil conditions, to gain information on site size when only limited areas of exposed ground were present, and to determine depth of deposit. Although this procedure proved invaluable in investigating local soil conditions, and depth of deposits, it was much less useful in determining site size in low visibility areas.

It should be noted here that the definition of a site used on the 176 By-pass survey was that proposed by House and Ballenger (1976: 50). Their definition is as follows:

... any location with observable physical evidence of past cultural behavior. The relevant behavior here is all prehistoric Indian activity or early historic activity. All loci of prehistoric activity--even isolated biface fragments or a few flakes--were recorded as archeological sites....

Archeologists have traditionally defined sites in a multitude of ways. Unfortunately, only lately have a few archeologists begun to systematically record low density activity loci as "sites." Since one of the major objectives of archeology is to describe a complete behavioral system at a given point in time, it becomes necessary to systematically record and analyze all outputs of past behavior whether they be large habitation sites with a high density of artifacts representing numerous types; or sites consisting of one or two artifacts which could be interpreted as an individual attempting to sharpen a hunting implement.

### *Survey Constraints*

Since the U.S. Highway 176 By-pass survey represents the first intensive investigation of archeological sites in the Union-to-Pacolet vicinity, only a limited body of data in the site files at the Institute was available to draw upon and guide the present research. Consequently, this survey was the first systematic attempt to record such phenomena as site variability and site density for the area.

Several constraints on research were encountered during the Phase II operation of the survey. These were poor ground surface visibility, which hampered our ability to perceive site locations and size and inclement weather, which drastically shortened the overall time that the survey crew spent in the field.

One of the primary goals of highway engineers is to select a route economically feasible for the Highway Department. In this case, the 176 By-pass was laid out to minimize impact of residential areas, thus reducing the costs of purchasing individual properties and

the overall cost of the proposed highway. Therefore, the chosen route crosses undeveloped areas such as farm lands presently used for pasture and crops. As a consequence, the corridor crosses heavily dissected lands, the result of numerous small streams and intermittent creeks. These areas, with the exception of recently plowed fields, are not readily accessible for a 100% survey coverage. Table 1 represents the relative amounts of different land uses encountered during the survey.

TABLE 1  
TERRAIN AND LAND USE ENCOUNTERED DURING PHASE II  
OF U.S. HIGHWAY 176 BY-PASS SURVEY

	Extent (linear miles)	Visibility factor	Intensity of time and labor investment
Open lands			
1. Cultivated fields	2 1/2	Good	Low
2. Pasture fields	4 3/4	Moderate-Poor	Moderate
Forested lands			
1. Uplands	3	Poor	High
2. Dissected drainages	8 3/4	Very Poor	Very High

Inclement weather reduced the actual field time we had to conduct the survey. Of the 19 total work days in the field, eight were lost to various forms of precipitation and winds gusting to tornado force. This severe time limitation on fieldwork necessitated a change in survey strategy to complete the survey in areas which required less time and labor investment. In all, it is estimated that 85% of the U.S. 176 By-pass corridor was systematically surveyed.

#### *Evaluation of Methods*

At the beginning of Phase II an attempt was made to systematically survey the entire proposed route, including all four types of present-day land use terrain identified in Table 1. Due to inclement weather, a change in the survey strategy was necessary. Since only very few, small sites were found in the dissected drainages, we eliminated inspection of this type of terrain from the remainder of the survey. Additionally, the time and labor required to climb these steep slopes in heavily forested lands contributed to our decision to eliminate these areas from further investigation. Although this resulted in less than 100% survey coverage of the route, we feel that a representative sample of sites was located.



Lipe (1974) argues that significance of archeological resources is best evaluated in a regional framework. Unfortunately, highway corridors because of their limited size and cross-cutting nature, do not usually lend themselves to regional model building. However, when similar collection techniques and sampling schemes are employed by a number of different researchers, a statistically comparable data base is insured, thus providing information amenable for synthesis. The U.S. Highway 176 By-pass survey provides a good chronological, size, and tool assemblage cross-section of sites in the area. In combination with past and future archeological research we hope that a more complete picture of Piedmont history and prehistory can be developed.

## SITE DESCRIPTIONS

A discussion of the sites found within the proposed right-of-way of U.S. Highway 176 By-pass is presented below. Each site description includes description of site location, present environmental setting, boundaries of the site when that could be determined, method used in collecting artifacts from each site, and any disturbances (e.g. plowing, road and house construction, etc.). Also included is a discussion of soil types at the site and inferences about past vegetational associations. The information obtained about the soils and past environments was gathered from Camp, *et al.* (1975). A catalogue of all materials recovered during this survey will be found in the appendix.

38UN22. This lithic scatter is a ridge top site overlooking several intermittent streams that flow into Buffalo Creek. It is located in a fallow field north of Toney Road, approximately 500 meters from existing U.S. Highway 176.

The cultural materials found at the site represent a low density output. Given poor ground surface visibility, the approximate site size of 50 square meters was estimated by observing the presence of cultural materials in eroded areas. A controlled collection of artifacts was taken from these exposed locations. The absence of diagnostic artifacts at the site precluded temporal assignment at this time.

The soil is characteristic of that found on medium to broad ridges having a slope of two to six percent. A grayish-brown, sandy loam topsoil was present down to a depth of 15 centimeters. Below this was a red clay subsoil. The native vegetation covering this area was oak, hickory, maple, elm, and pine trees, with an understory of shrubs, vines, briers and grasses. This vegetation and terrain are capable of supporting both woodland and openland animal species.

38UN23. This site is a ridge top lithic scatter discovered in a plowed field adjacent to a paved road. It is located approximately  $\frac{1}{2}$  kilometer west of existing U.S. Highway 176 and  $\frac{1}{2}$  kilometer north of Toney Road.

Cultural material from the site was recovered by a controlled collection of all exposed areas. Overall ground surface visibility was good, allowing for a site size estimation of 75m x 50m. Preliminary artifact analysis indicates a Middle Archaic occupation at the site.

The soils are typically associated with medium ridges and sides of drainages exhibiting six to ten percent slopes. Shallow gullies, rills, and galled areas are commonly associated with these soils. The topsoil is a reddish-brown sandy clay loam, which extends down to a depth of 15 centimeters. The subsoil is a red clay. The native vegetation associated with these soils was oak, hickory, maple, elm and pine with an understory of shrubs, vines, briers and grasses. Woodland animals are suited for this environment.

38UN24. Site 38UN24 is a ridge top lithic scatter which overlooks several intermittent streams flowing into Buffalo Creek. The site is located in a plowed field approximately 800 meters west of the County Nursing Home.

Recent plowing resulted in excellent ground visibility which allowed for a site size estimate of 30 square meters. The low density output of artifactual material was collected by the controlled method of exposed areas. Diagnostic artifacts indicative of the Middle and Late Archaic periods were recovered.

The soils found at this site are typically identified with gently sloping to steep, well drained slopes. They often occur on medium and broad ridges. The topsoil was a grayish-brown sandy loam which extended to a depth of 15 centimeters. The subsoil was composed of a red clay loam. This type of soil most likely supported a mixed hardwood and pine forest with an understory of shrubs, vines, briers and grasses. Both woodland and openland animal species are suited to this environment.

38UN25. This site is situated on a ridge top overlooking a permanent stream flowing into Buffalo Creek. It is located in a plowed field approximately 500 meters to the southeast of 38UN24.

Ground surface visibility was very good which allowed us to estimate the size of the lithic scatter to be approximately 200 square meters. A controlled collection of artifacts was made in exposed areas. The preliminary analysis of diagnostic artifacts indicates a Middle Archaic occupation at the site.

Soils are representative of those found on irregularly shaped, medium and broad, eroded ridges. The topsoil is a reddish-brown, sandy clay loam which extends to a depth of fifteen centimeters. The subsoil consists of red clay. Vegetation which can be supported by such soils includes oak, hickory, maple, elm and pine trees with an understory of shrubs, vines, briers and grasses. Animal populations capable of being supported by such an environment include both woodland and openland species.

38UN26. This site is a ridge top lithic scatter situated approximately 450 meters west of Upper Fairforest Church. It is located in an old, fallow corn field.

Although ground surface visibility was limited, a controlled collection of all artifacts was made in the eroded areas. By observing the spatial distribution of cultural materials, the site size was estimated to be 30 square meters. Preliminary artifact analysis indicates a Middle Archaic occupation.

The soils are those typically associated with medium ridges and drainages with six to ten percent slopes. A reddish-brown, sandy clay loam topsoil extends for a depth of approximately 15 centimeters. The subsoil is a red clay. Native vegetation in these areas includes oak, hickory, maple, elm and pine trees with an understory of shrubs, vines, briers and grasses. The woodland animal species are suited to this environment.

38UN27. Site 38UN27 is a ridge top lithic scatter located approximately 300 meters south of Bonham Road and 600 meters west of existing U.S. Highway 176. This site, situated in a plowed field, was easily collected because of good ground surface visibility.

Cultural material from the site was recovered by a controlled collection of artifacts over an area of 150m x 75m. A preliminary analysis of the artifacts indicates that the site has multiple components with the Middle Archaic and Woodland periods present.

Soil at this site is typical of those soils located on irregularly shaped, broad ridges with two to six percent slopes. There was approximately thirteen centimeters of brown, sandy loam topsoil remaining after erosional processes. Below the topsoil was a red clay subsoil. This soil complex is capable of supporting a mixed hardwood and pine forest with an understory of briars and grasses. The vegetation and terrain are suitable for both woodland and openland animal species.

38UN28. This site lies on the north side of a paved highway approximately 3/4 of a kilometer southwest of Jonesville, South Carolina. 38UN28 is a lithic scatter situated in a fallow corn field. It is located on a ridge top, which overlooks several intermittent streams draining south to Bishop Branch Creek and north to Rocky Creek.

Although overall ground surface visibility was moderate to poor, site size was estimated to be 300m x 200m. This estimate was based on a series of controlled collections of all artifacts in those limited areas of good visibility. Artifacts recovered indicate an occupation from the Early Archaic through the nineteenth century.

The soil at this site is identified as being associated with medium sized ridges and adjacent drainageways. It has a sandy loam topsoil which extends to a depth of 15 centimeters and is normally found on six to ten percent slopes. At 15 centimeters the soil changes to a hard, red clay.

The native vegetation on such soils is mixed hardwood and pine forest with an understory of briars and grasses. Woodland and openland animal species are suited to this environment.

38UN29. This site lies on the south side of a paved highway approximately three quarters of a kilometer southwest of Jonesville, South Carolina. This lithic scatter covers 30 square meters. Found in a small, fallow corn field, this site may originally have been associated with 38UN28; however, twentieth century economic disturbances (e.g. house and highway construction) have isolated the site.

The ground surface visibility was characterized as limited with a controlled collection being made in those areas where artifacts were detected. Preliminary analysis of artifacts indicates Middle and Late Archaic components. A high slope inclination with heavy rill erosion has washed away any topsoil that may have been present at the site. All that remains is the dark red, clay subsoil which was observed at a depth of 15 centimeters at 38UN28.

The original vegetation covering the site was mixed hardwood and pine forest capable of supporting both woodland and open land animal species.

38UN30. Site 38UN30 is situated on a ridge top approximately one kilometer west of New Hope Church. The site is located in an old plowed field which had been terraced to prevent erosion. Presently the field is being used for pasture.

Cultural material was collected within an area of 100 square meters. Definition of site boundaries was difficult due to ground cover and lateral movement of artifacts by terracing. A controlled collection of artifactual material was made in exposed areas. Preliminary analysis of diagnostic artifacts indicates a Middle Archaic period occupation.

The topsoil at the site was heavily disturbed but is characterized as a sandy loam found on broad ridges having two to six percent slopes. This soil is conducive to a mixed hardwood and pine forest vegetation. Both woodland and open land animal species are suited for this environment.

38UN31. This site is situated on a ridge top knoll and is located approximately one kilometer north of Whitlock Lakes. The site overlooks Spear Creek and several intermittent streams. Today the site lies in a fallow field that has been overgrown with kudzu. Although ground surface visibility was poor, cultural material was collected by digging six small, 15 centimeters deep, 30cm by 30cm test pits. Artifacts recovered include quartz cobbles and quartz debitage. No site delineation was possible. It is hypothesized that extraction of raw materials for the manufacture of stone tools took place here.

The soil at this site is common on gently sloping to strongly sloping, well drained ridges. The topsoil had been completely eroded, exposing a dark red clay on the surface. Associated with this soil are oak, hickory, dogwood, sourwood, holly, red cedar and pine and an understory of brambles, shrubs, briers, vines and grasses. The vegetation and terrain are suitable for both woodland and open land animal species.

38UN33. Discovered on a small rise bisected by Bonham Road, this site is a ridge top lithic scatter. It lies about 90 meters south of Bonham Road, approximately 250 meters west of U.S. 176. Presently the site is located in a powerline cut beside an old dirt road.

The cultural materials at 38UN33 are characterized as a low density output. Ground surface visibility was poor with the exception of the dirt road. To delimit site size, a subsurface testing study was conducted by placing a series of 30 cm square test pits perpendicular to the road; however, no artifactual material was recovered by this method. Consequently, site size was estimated to be 50 square meters based on inspection of the spatial dispersion of artifacts within the dirt road. A controlled collection of artifacts was made within the roadcut. No diagnostic materials were found at the site.

The soil at the site is characteristically found on slopes of two to six percent and irregularly shaped broad ridges. The subsurface testing allowed us to observe the presence of 15 to 18 centimeters of topsoil. The subsoil consisted of a red clay with a subangular blocky structure. Native vegetation associated with this soil type is mixed hardwood and pine forest with a grassy understory. Both woodland and openland animal species are suited to this environment.

38UN49. This site is located on a dirt road intersecting New Hope Church Road. The lithic scatter was found along the road in a heavily wooded area. Forest cover made determinations of site dimensions impossible. Several subsurface test pits measuring 30 cm square were dug adjacent to the roadway but no cultural materials were recovered. A controlled collection was made within the road cut. No diagnostic materials were found.

The soils present at the site are those associated with heavily dissected areas where slopes range from 15 to 40 percent. Topsoil was noted in the test pits down to a depth of 13 centimeters. A red clay loam mottled with a yellowish stain composed the subsoil. This soil is conducive to an oak, hickory and pine forest with an understory of vines, shrubs, briers and grasses. The local environment is capable of supporting woodland animals.

38UN50. Site 38UN50 is located approximately  $\frac{1}{2}$  kilometer to the south of 38UN49. The lithic scatter is situated along the road in a heavily wooded area. Forest cover made site size determination impossible. Several subsurface test pits measuring 30 cm square were dug adjacent to the roadway revealing no cultural materials. A controlled collection of artifacts was made within the roadway. No diagnostic materials were found.

The soils and environmental setting of this site are the same as discussed for site 38UN49.

38UN51. Site 38UN51 is a ridge top lithic scatter overlooking Rocky Creek. The site is located in an overgrazed pasture approximately 1.2 kilometers west of existing U.S. Highway 176.

Although ground surface visibility was limited, a controlled collection of cultural material was made in those exposed areas resulting from overgrazing and rill erosion. Site size was estimated to be 75m x 50m. No diagnostic artifacts were recovered to allow a temporal assignment. The soils found at this site are associated with gently sloping to steep slopes on medium ridges and sides of drainageways. Shallow gullies, rills and galled areas are common. Due to differential erosion over the site, some areas still maintained the reddish-brown, sandy clay loam topsoil, while other areas of the site had no topsoil remaining. Native vegetation on this soil was oak, hickory, maple, elm and pine with an understory of shrubs, vines, briers and grasses. This vegetation and terrain are capable of supporting woodland animal species.

38UN52. This site is located in the same pasture as 38UN51. It is situated on a ridge finger overlooking Rocky Creek.

Cultural material was collected by total pickup of artifacts in eroded areas. Site size was estimated to be 75 square meters based on inspection of those areas of good visibility due to rill erosion and overgrazing. The ground surface visibility was poor over the remainder of the site. No diagnostic artifacts were recovered precluding a temporal assignment.

Site 38UN52 is in a similar environmental setting as described for 38UN51.

38UN53. This site is a ridge top lithic scatter located in the same pasture as 38UN51 and 38UN52.

Cultural material was collected by total pickup of artifacts in those areas of good visibility. Site size was not determined for this site due to the poor, overall ground surface visibility. No diagnostic artifacts were found, permitting a temporal assignment to the site.

The soils and associated plant and animal communities are the same as discussed for 38UN51.

38UN54. The site is a ridge top lithic scatter situated on the east side of a paved road overlooking the headwaters of Cunningham Creek. The continuity of 38UN54 has been disrupted by construction of several houses and erosion, effectively segmenting the site into four distinct loci. Each locus was given a separate designation and a controlled collection was made from each.

Locus A was situated in a sparsely vegetated yard of a house trailer. Cultural material was collected throughout the yard and in the backdirt of the foundation. An estimate of locus size was 150m x 75m. The diagnostic artifacts recovered indicate a Middle Archaic occupation.

Locus B is located approximately 20 meters south of Locus A and is situated on a small knoll overgrown with hardwood trees. Although ground surface visibility was limited by leaf litter, several exposed areas existed where a high density of lithic debris was recovered. Locus size was estimated to be 150m x 75m. Diagnostic artifacts recovered indicate a Middle Archaic occupation.

One 30 cm square test pit was dug to monitor the soil development in the vicinity of Locus B. Surprisingly, 1.5 meters of sand caps a gravelly red clay subsoil. Cultural material was recovered from the backdirt of this test pit suggesting the possibility of in situ artifacts.

Locus C is located 40 meters south of Locus B in the yard of a recently constructed house. Obviously the terrain had been leveled and fill material added. Cultural material was recovered from a small exposed area of approximately 40 square meters. Diagnostic artifacts indicate a Middle Archaic occupation.

Locus D is located 50 meters south of Locus C in a recently plowed field. Cultural material representing a dense concentration was recovered in an area of approximately 175m x 75m. The diagnostic artifacts recovered indicate a Middle Archaic occupation.

The soil at 38UN54 is typical of soils found on irregularly shaped broad ridges with two to six percent slopes. Topsoil at the site is a sandy loam, thirteen centimeters deep. Below this is a red clay subsoil. The native vegetation of this soil is a mixed hardwood and pine forest with an understory of briers and grasses. Both woodland and openland animal species are suited to this habitat.

38UN85. Site 38UN85 is located across Bonham Road from 38UN33. The cultural material at the site may be described as a lithic scatter of low density. Due to the recent plowing of the field, excellent ground visibility allowed us to delimit site size at approximately 25m x 50m. No diagnostic artifacts were recovered.

The soil found at this site is typical of that on broad ridges with topsoil development to a depth of 18 centimeters; however, the plowed field was heavily eroded, exposing the red clay subsoil. Native vegetation consists of mixed hardwood and pine forest capable of supporting both woodland and openland animal species.

38UN86. This site, located on the north slope of a ridge top, is situated approximately 150m west of 38UN85. It overlooks an intermittent stream which drains into Rocky Creek.

The artifact content of the site corresponds with that of 38UN85, a low density lithic scatter. Ground visibility was poor and no site size estimate was possible. A controlled collection of exposed areas was made wherever artifacts were observed.

Site 38UN86 is within the same environmental setting as 38UN85 and is capable of supporting the same wildlife species.

38UN96. This site is a lithic scatter situated in a pasture on the west side of an old farm road. 38UN96 is located approximately 350 meters northwest of 38UN54 at the headwaters of several small streams.

A low density of cultural material was observed in the road cut where ground surface visibility was good. Outside of the road cut, ground surface visibility was extremely poor, precluding any approximation of site size. A controlled collection of all artifactual material was conducted in exposed areas. No diagnostic artifacts were recovered to permit a temporal assignment.

The soil type at this site is identified as typical of those soils located on irregularly shaped broad ridges with two to six percent slopes. There were approximately thirteen centimeters of a brown sandy, loam topsoil remaining on the site. Below the topsoil was red clay



subsoil. This soil complex is capable of supporting a mixed hardwood and pine forest with an understory of briers and grasses. The vegetation and terrain are suitable for both woodland and openland animal species.

38UN97. The site is a ridge top lithic scatter situated on a flattened area of a gradually sloping hill. 38UN97 is located in a plowed field approximately 50 meters northwest of 38UN28 overlooking the headwaters of a small intermittent stream.

The ground surface visibility provided a 45-50% coverage of an area 25m x 20m. Cultural material representing a low density output was recovered by controlled collection of artifacts in exposed areas. No diagnostic artifacts were recovered precluding a temporal assignment.

The soil at this site is identified as belonging to medium sized ridges and adjacent drainageways. A sandy loam topsoil found on six to ten percent slopes, extends to a depth of 15 centimeters. At 15 centimeters, the soil changes to a hard red clay.

The native vegetation on such soils is mixed hardwood and pine forest with an understory of briers and grasses. Both woodland and openland animal species are suited to this environment.

## *DATA INTERPRETATION*

### *Historic Data*

Only one Historic period site, 38UN28, was located within the proposed U.S. 176 Highway By-pass corridor. The site is in a field currently under cultivation, some 25 meters north of secondary road #12 and is situated on a ridgetop approximately .75 kilometers southwest of Jonesville. Artifactual materials were recovered from surface collections and revealed the multicomponent nature of the site. Diagnostic artifacts ranging in time from the Early Archaic through the Historic period were distributed across the surface of the cultivated field. For the most part, the inventory of Historic artifacts consisted of ceramic sherds and broken glass.

Ironstone whiteware and variations of this (e.g. blue bordered and transfer printed overglazed floral designs) were the most frequently occurring ceramic types in the sample from 38UN28. Feldspathic and Brown salt glazed earthenwares were also fairly common. Several pearlware ceramic fragments, both green and blue shell edged, were present. In addition, colored glass fragments, fragments of a porcelain tea cup with transfer printed overglazed floral designs, and a porcelain doll arm were also recovered. Brooks (personal communication) suggests that these ceramic materials are indicative of a temporal span from the middle to late nineteenth century and most probably represent a late nineteenth century occupation. It is further suggested that these artifacts are probably representative of a domestic household occupation of 38UN28 during the late nineteenth century.

### *Research Objectives and Findings for Prehistoric Data*

#### *Introduction*

The approach taken toward research on the U.S. 176 By-pass survey is subsumed under the problem domain of Ecological Analysis as it is defined by Goodyear (1975) in the general highway archeology research design. In brief, this domain deals with the systemic relationships between past human populations and the environment. Specifically, the basic aim of this study is to examine changing patterns of prehistoric utilization in the inter-riverine Piedmont (see House and Ballenger 1976) as these patterns are reflected along the corridor of the U.S. 176 By-pass.

The basic methodology chosen for this study entails the comparison and correlation of aspects of the material outputs at archeological sites with distinctive environmental variables or combination of variables. Such a procedure requires the building of theory to interlink elements of the environment with site types in a manner that will yield explanations of changing patterns of utilization in a given region. As a region, the Piedmont presents a number of difficulties in the construction of such relationships. Prior to moving into the general body of the study a brief discussion of the state of research in regard to site/environment relationships is presented.

### *An Evaluation of Prior Research*

A survey of previous Piedmont research (eg. House and Ballenger 1976; Wogaman 1977a, 1977b; Most 1977, Cable and Michie 1977; Cable, Michie and Perlman 1977; Goodyear 1978) indicates that site/environment relationships are not well formulated or understood at the moment. To date, only the Interstate 77 survey (House and Ballenger 1976) has systematically approached this type of study in the inter-riverine Piedmont. House and Ballenger selected the site catchment (Jarman, Vita-Finzi and Higgs 1972) method to correlate site types with environmental variables. The environmental variables selected for quantification were: 1) the amount of bottomland associated with a rank 3 or larger stream and 2) the number of rank 1 and 2 streams. By the use of chi-square and Kolmogorov-Smirnov statistics, these measurements were compared with four functional site categories: quarry/workshop sites, habitation sites, isolated finds and extraction sites. However, those statistical tests failed to discern significant associations, at the .05 level, between the selected environmental variables and different site types. The authors point to four possible inherent sources of difficulty that may have been instrumental in their inability to identify patterning from the analysis: 1) the environmental variables selected may have had no effect on site type patterning; 2) the environment is homogeneous and, as such is not amenable to site catchment analysis; 3) the range of variability in site type was not sampled by the I-77 transect; and 4) the site sample sizes were not large enough to depict the true patterning in site/environment relationships (House and Ballenger 1976).

It is probable that all of the sources of difficulties cited by House and Ballenger played a significant role in their failure to discern site/environment patterning. These difficulties can be essentially characterized as control problems. The first two difficulties relate to the problems inherent in controlling the environment. That is to say, it is theoretically unclear what effects bottomland and the proximity of low ranked streams should have had on the general optimizing strategies of prehistoric human populations or what exact effects such variables should have on the general pattern of site location. Thus, although it might be true that the variables selected by House and Ballenger exhibit very little effect on site location, it is difficult to evaluate this alternative because the exact nature

of the relationship between these variables and site type cannot be stipulated in terms of expected patterns. Without an understanding of the significance of an environmental variable for determining settlement pattern, recognition of regularities in site/environment relationships is nearly impossible to discern and generally results in interpretations devoid of explanatory power. Accordingly, unless the Piedmont uplands are in actuality homogeneous as House's and Ballenger's second alternative states, the proper approach in the selection of environmental variables should involve the identification of aspects of the environment that can be linked to theory concerning the factors that have strongly conditioned the utilization of the inter-riverine Piedmont. This concept will guide the selection of environmental variables for the U.S. 176 Bypass study.

The final two control problems relate to approaches to archeological site variability. It is becoming increasingly obvious to Piedmont researchers that the selected routes of proposed highways very seldom sample the entire range of variation in past human subsistence-settlement systems. For instance, transects which cut across major ridge fingers, as is the case in the I-77 survey and the U.S. 176 Bypass survey, will almost entirely miss one of the major segments of the Early Archaic system which centers on broad, flat watershed divides (see Goodyear 1978) above the major ridge fingers that run perpendicular to the spines of the watersheds. Consequently, accurate proportions of site types based on function will only rarely be reflected by highway transects. This circumstance gives rise to a major implication. Since only partial systems are represented in most highway transects, the use of a "whole systems" (function) typology for site variability will result in an incomplete articulation of site/environment patterning for any one survey data base. The end result, as House and Ballenger (1976) testify, is the suggestion of only weak hints of larger-scale patterning. Therefore, it is argued here that the scale of criteria for discerning variability in sites should be sufficiently narrowed so that they focus on more locally restricted qualities of the environment. This point will be more fully developed in the section on identifying relevant archeological attributes for the study of site/environment relationships.

The second site variability control problem suggested by House and Ballenger concerns the problem of small sample sizes. This problem directly relates to the effectiveness of generalizing from a sampling population to a population universe (see Blalock 1972 for a succinct discussion of this problem). Essentially the authors were concerned with the possibility that maintenance (or habitation) sites were substantially under-represented in their sample or at least constituted such a low N (number of cases) that it was difficult to incorporate this site type into statistical tests of association. Low sample sizes will continue to be a chronic limitation for highway surveys, as will the reliability of random sampling procedures in the field. As yet, an effective sampling methodology for site discovery in heavily forested or other low-visibility situations has not been developed.

Not only are statements of site frequency unreliable, but it becomes difficult or impossible to assess the properties (ie. size, artifact density, function, component representation) of a site, once it is discovered, in a heavily vegetated area without the implementation of extremely cost-prohibitive testing techniques. As such, the current limitations placed on obtaining statistically reliable samples dictate that methods be developed to conduct and assess non-probabilistic data collection methods. An intrinsically effective approach, given our present state of technological expertise, would be to concentrate data collection activities on areas of high visibility such as plowed fields, clear-cut acreage or road cuts. This would direct research statements based on surface collection data away from a heavy reliance on partial assessments of the nature of archeological sites under low visibility conditions and toward data more reliable for examining the relationships between properties of the archeological record and aspects of the environment. It should be cautioned that data collected predominantly from high visibility surfaces are subject to the biases inherent in the operations of twentieth century economic activities (ie. agriculture, house construction, road construction, etc.) and cannot be treated as a representative sample of the types of data present in any area. However, by limiting generalizations about this data to statements of positive correlation and association we can control most of these biases by avoiding the issue of negative data altogether. That is to say, positive statements of relationships about known data do not make unwarranted assumptions about archeologically unknown areas of "missing data" as a rubric for interpretations. The potential effectiveness of this approach was first recognized by House and Ballenger (1976) and has recently been field operationalized by Goodyear (1978) in the Laurens-Anderson survey and by the authors of this report of the U.S. 176 By-pass survey.

It should not be concluded from this discussion, though, that we are recommending that probability sampling or inspections of low visibility areas be abandoned. Obtaining accurate representations of the characteristics of the archeological record is essential for constructing processual interpretations for any region. Efforts to implement effective testing procedures should continue to be a concern of all surveys. The former discussion is meant to state simply that our present level of technological expertise allows for only very limited applications of data collected in low visibility situations and that attempts to obtain probabilistic samples in eastern North America are extremely hindered by our limited abilities to assess data collected from areas of low visibility.

#### *Selection of Environmental Variables*

It has been argued that the proper approach to the selection of environmental variables should begin with the identification of aspects of the environment that can be linked to theory concerning the factors

that have strongly conditioned the utilization of the inter-riverine Piedmont. One factor which has played a dominant role in influencing the patterns of utilization in any environment is the differential distribution of productivity (Dyson, Hudson and Smith 1978; Hamilton and Watt 1970). In an environment such as the temperate forests of the Piedmont uplands where species diversity is low and species equibillity high (cf. MacArthur 1972), differential productivity may be the single most discriminating factor in explaining differential human spatial utilization. That is to say, in an environment tending toward homogeneity the degree of intensity of human utilization of any particular location is a function of that location's relative level of productivity through time. A variable that is directly related to productivity is soil type.

Soil types represents an ideal attribute for our purposes for three reasons. First, soils can be ranked with regard to relative productivity potential. As a consequence, soil productivity can be set up as a variable with spatially discrete distributions. Second, soil productivity is the direct result of the interaction between a number of environmental variables such as topography, slope, erosion and parent material which, separately, do not relate one-to-one with productivity. Therefore, the unclear articulations of productivity with any of these environmental variables taken one at a time is avoided by the use of the combined attribute of soil patch distributions. Soil patches, then, clarify the relationship between a number of interacting environmental variables and productivity. Third, it is generally held by soil scientists (cf. Buol, Hole and McCracken 1973) that soil structure in the Piedmont has changed very little during the Holocene. Of course, the extreme erosional impact of farming activities in the nineteenth century (Trimble 1974) has altered the modern day soil composition to some degree, but the areas of highest soil productivity are located on the broad, gently sloping or flat ridge tops where erosion has been less severe. Areas of more extreme slope and thus subject to heavy erosion, on the other hand, have been areas of consistently low moisture retention and therefore, low productivity through time. Thus, it appears that relative soil conditions have remained relatively stable during the period of human occupation in the Piedmont.

The relative stability of soil conditions contains a further implication for climatic change. Even though the Holocene has experienced a number of climatic changes cycles that have affected a succession of plant community adjustments from an essentially boreal forest biome to the modern oak-hickory and oak-pine associations (cf. Whitehead 1965), locus-specific productivity has remained relatively constant due to the stability of soil productivity. Thus, it is reasonable to expect that modern soil patch distributions reflect a constant relationship with the relative productivity distributions of plant communities throughout the Holocene.

The United States Department of Agriculture Soil Survey of Laurens and Union Counties, South Carolina (Camp, et al. 1975) supplied the data on soil productivity patches as they relate to natural woodland groups in the U.S. 176 By-pass transect. Although the mineral composition of

the parent rock of soils constitutes a factor in relative productivity, the report correlates high soil productivity most directly with gentle (2-6%) slopes. Therefore, high productivity is primarily a function of the water retention qualities of broad, flat ridges where only a relatively small amount of precipitation is lost to run-off. The flat and low lying saddles between knolls on these major ridge systems serve as moisture collection basins and create patches that support the highest densities of mesic adapted nut-producing arboreal species such as white oaks and hickories (Oosting 1942). It is hypothesized that these species represented preferred food resources for aboriginal human populations in the eastern United States (Asch, Ford and Asch 1972). Although it is not clear whether nuts or deer were the target resource of aboriginal groups (see House and Ballenger 1976), the general relationship between high soil productivity and high food availability remains unaffected, since deer are dependent on the browse and acorn mast whose densities are highest in the areas of highest primary productivity (Smith 1975).

In conclusion it is argued that soil productivity represents a critical environmental variable for analyzing prehistoric patterns of utilization in the inter-riverine Piedmont. The major significance of the variable relates to its potential for explaining differential intensity of use as it is reflected in the archeological record. Soil productivity is especially applicable to site/environment studies because this variable is spatially discrete and has remained relatively constant through time. The next section will consider the selection of properties of the archeological record that relate directly to differential productivity.

#### *Hypothesis Formulation and the Selection of Relevant Archeological Variables*

Archeological sites in the inter-riverine Piedmont are characterized by extremely low variability. This phenomenon can be explained as the consequence of a long-lasting, change resistant, subsistence-settlement system oriented toward the procurement of an extremely limited range of resources, primarily white-tailed deer, nuts and lithic raw material (House and Ballenger 1976).

This model is based on two strong lines of evidence. First, the pertinent ethnohistoric accounts of aboriginal utilization of the inter-riverine Piedmont consistently depict a highly seasonal (Fall) pattern of exploitation directed toward the extraction of only a restricted range of resources (cf. Swanton 1946; Canouts 1971; Hudson 1972). Second, fundamental ecological theory characterizes temperate forests as highly unstable systems (seasonal) with relatively low species diversity (cf. MacArthur 1972; Pielou 1969; Odum 1971; and Whitaker 1965). Such conditions create an environment of extreme flux where food abundance and availability is highly predictable only during the fruiting season of the primary producers. In the case of upland hardwood forests seasonal abundance would correspond to the fall nut production of especially *Quercus* and *Carya* species. This results in an animal population characterized by a generalist adaptive strategy (see Chapman 1973).

Adaptation under these conditions can take two basic forms. One solution involves the occupation of a niche wide enough to allow permanent survival in a small horizontal and/or vertical space. An alternative solution entails increased mobility. In this case, the utilization of several different biotic communities is synchronized or scheduled to correspond with different periods of food availability. Animals of relatively large individual biomass such as white-tailed deer and non-agricultural or only partially agriculture-dependent human populations appear to have optioned for this second solution.

Although the basic instability of temperate forest ecosystems under conditions of pronounced climatological seasonality goes a long way toward explaining the low diversity of tool and debitage contents of upland Piedmont archeological sites, it doesn't sufficiently address the reasons for the persistence of a distinctively similar extractive assemblage throughout the minimally 12,000 year record of human occupation in South Carolina. The reason for its persistence relates perhaps to the characteristic resiliency of temperate zone ecosystems with marked seasonality (see Chapman 1973). In other words, even though these ecosystems are unstable, the wide tolerance ranges of the species which compose them create extremely resilient communities that are highly resistant to minor climatic fluctuations and other types of lower magnitude perturbations. Thus, it can be surmised that the low variability and ephemeral nature of inter-riverine Piedmont sites are strongly linked to the ecological properties of unstable but resilient temperate forest ecosystems.

Given these ecological parameters and their postulated effects on the observed archeological record of the inter-riverine Piedmont, it should be asked: What qualities of the record will allow us to discern meaningful variation in the archeological data base? The framework of the U.S. 176 By-pass study dictates that qualities directly related to differential productivity be selected. An exceedingly useful concept for this purpose would be "Intensity of Use." It stands to reason that the degree of intensity of utilization of loci should be expected to positively correlate with their relative levels of productivity. That is to say, loci identified as relatively high in productivity should exhibit significantly higher densities and larger areal extent of artifactual outputs reflecting intense utilization. The inverse should also hold. Loci of relatively low productivity should contain lower artifactual densities and smaller areal extent indicative of limited or low intensity use.

Two corollary relationships are suggested by the concept of intensity of use. First, it follows that loci of high use intensity should also represent loci of more frequent and longer activity time spans. This should result in significantly higher probabilities for the occurrence of "curated" formal tool categories. In other words, there is a higher probability of loss or discard of a tool in areas that have experienced longer or more frequent occupations or utilization spans, regardless of the possible association of maintenance activities with loci of high productivity where it is expected that a wider range of tool types would



occur based on functional differentiation. This relationship derives from the observation that increased time usage of a locus will increase the probability of tools entering the archeological record from loss, breakage or the "burning-out" of an item (see Binford n.d.). Therefore, a positive correlation should be expected between productivity and tool diversity. Therefore, assemblages from relatively high productivity loci should contain significantly higher levels of tool diversity than loci of lower productivity.

The second corollary describes the expected relationship between the resiliency of temperate forest ecosystems and the constant boundaries of differential productivity as reflected by soil type. This relationship is directly linked to the problem of multicomponency. It has long been observed that many archeological sites in the eastern United States contain temporally diagnostic artifacts from a number of culture-historical periods. This property of archeological sites is commonly seen as the result of some type of formula of preferred site location. For the inter-riverine Piedmont, we suggest that the phenomenon of multicomponency is highly conditioned by the constancy of the locations of high productivity patches through time. Thus, it is expected that loci of high productivity should exhibit evidence of high use intensity through time. Sites in such loci should contain evidence of occupation from a wider range of culture-historic periods than sites in lower productivity loci. It also follows that loci of high productivity should contain significantly larger frequencies of diagnostics from each culture-historic period than loci of lower productivity.

The above discussion then, outlines four major data categories that are required to test the hypothesis that the degree of intensity of utilization in the inter-riverine Piedmont positively correlates with the relative productivity ratings of soil patches or loci. The method of quantification for these data categories is described below:

1. Density. Present site evaluative techniques allowed us to obtain only a crude measure of this variable. Density was determined by first multiplying the total number of artifacts collected at a site by an adjustment for ground visibility. Ground visibility estimates were recorded as percentages ranging from 0% in heavily forested areas to 100% in freshly plowed fields. The ground visibility adjustment was determined by subtracting the estimated percentage of visibility from 100%. In cases of 100% visibility the adjusted ground visibility value was 1. All other values obtained were less than 1. The product of this multiplication was then divided by the area (in square meters) collected to arrive at a crude estimate of density. Sometimes, the area of collection corresponded to the estimated limits of the site, at other times it was restricted to a smaller area within the bounds of the artifact scatter. In the second case, this usually meant that site boundaries could not be established.

2. Size. The measurement of the areal extent of sites corresponded to the visible limits of artifactual debris scatters. In a plowed field this technique is quite adequate, but in conditions of low visibility it becomes a more subjective undertaking. However, the authors feel confident that estimates of this variable adequately reflect more general size modes and, therefore, should effectively depict meaningful patterning in size relationships.

3. Tool Diversity. Diversity measures, as the name implies, are oriented toward depicting the number of different types within a major category of items. However, this procedure can result in the masking of significant variation that could otherwise be detected in the relative abundances of these different types. For this reason two diversity measures were constructed. The first deals simply with the number of different tool types and is called the Tool Diversity Index. This index is derived by dividing the total number of tool types present at each site by the total possible number of tool types as identified from all the sites in the U.S. 176 By-pass corridor. (Information on the tool types identified and the types of tools present at each site is tabulated in Appendix A.) The second measure is called the Tool Diversity-Abundance Index and is obtained by multiplying the total number of tools from each site by the Tool Diversity Index.

4. Multicomponent Diversity. As in the case of tool diversity, two measures need to be obtained. First, the Multicomponent Diversity Index is derived by dividing the sum of components recorded from each site by the total possible number of components identified for the survey. The second measure, the Multiplecomponent Abundance Index, is derived by adding .143 (the ratio of 1 projectile point to the possible number of different projectile points identified in the survey data) to the Multicomponent Diversity Index for each additional diagnostic projectile point at the site.

The following section will test the hypothesis outlined above by contrasting the archeological outputs of sites located in highly productive soils from those located in soil patches of lower productivity.

### *Hypothesis Testing*

#### Statement of Hypothesis

The first step in the test of the hypothesis is to formally state the relationship between productivity and intensity of use and to concisely delineate the coincident test implications.

H<sub>1</sub>- The intensity of utilization of the inter-riverine Piedmont is positively correlated with productivity as reflected in soil conditions (intensity of utilization increases with increased soil productivity). If this relationship exists, the following test implications are expected:

- I<sub>1</sub>- Expect site densities to increase with increased soil productivity.
- I<sub>2</sub>- Expect site size to increase with increased soil productivity.
- I<sub>3</sub>- Expect tool diversity and abundance to increase with increased soil productivity.
- I<sub>4</sub>- Expect multicomponent diversity and abundance of sites to increase with increased soil productivity.

#### Selection of a Statistical Test

A consideration of the structure of the stated hypothesis suggests that Spearman's Rho (Spearman 1904), a non-parametric rank correlation statistic, constitutes a well suited test statistic. This statistic is considered especially appropriate because: 1) the statistical design is structured so that statistical hypotheses are set up to correspond to the types of relationships stipulated; 2) non-parametric statistics do not require large numbers of cases to obtain reliable results and 3) Spearman's Rho is tailored to use ordinal scale data (the only available level of measurement for soil productivity rankings). The random sampling assumption can be partially suspended if the sites of the U.S. 176 By-pass are treated as the cases in a random transect sample. Even though the location of the corridor was not chosen at random per se, it can be argued that the line of the route actually does sample the range of variability in one distinctive inter-riverine Piedmont environmental situation which encompasses the highly dissected ridge fingers running out from the higher broad, flat watershed divide spines. The I-77 survey (House and Ballenger 1976) covered this same environmental situation and reports similar proportions of culture-historic data.

The set of data to be used in the testing of the hypothesis of use intensity is recorded in Table 2.

The six intensity measures (density, size, Tool Diversity Index, Tool Diversity Abundance Index, Multi-component Diversity Index, and Multi-component Abundance Index) for each site will be paired with the soil productivity rating (higher values represent relatively higher levels of productivity) of the soil from each site. Spearman's Rho test for mutual independence will then be applied to the six paired data sets to statistically evaluate the various test implications of the research hypothesis.

TABLE 2

## TEST DATA

Site Number	Density (artifacts per square meter)	Size M <sup>2</sup>	Tool diversity index	Tool diversity abundance index	Multicomponent diversity index	Multicomponent abundance index	Soil Productivity rank*	Soil type
38UN22	.012	2500	.2	.4	0	0	2	MdB
38UN23	.003	3750	.2	.4	0	0	1	MeC2
38UN24	.006	900	.2	.4	.286	.286	2	MdB
38UN25	.006	3750	.4	1.2	0	0	1	MeB2
38UN26	.009	900	.2	.2	0	0	1	MeC2
38UN27	.017	5000	.6	3.6	.286	.286	3	CIB
38UN28	.020	20,000	.6	5.4	.571	.713	3	CIC2
38UN29	.023	900	.4	.8	.143	.143	3	CIC2
38UN30	.008	2500	.4	.8	.143	.143	3	CIB
38UN31	ND	ND	ND	ND	ND	ND	ND	ND
38UN33	ND	ND	ND	ND	ND	ND	ND	ND
38UN49	ND	ND	ND	ND	ND	ND	ND	ND
38UN50	ND	ND	ND	ND	ND	ND	ND	ND
38UN51	.021	3750	.2	.6	0	0	1	MeC2
38UN52	.017	4500	.6	3.0	0	0	1	MeC2
38UN53	ND	ND	ND	ND	ND	ND	ND	ND
38UN54	.049	52,500	1.0	38.0	.571	1.0	3	CIB
38UN85	ND	ND	ND	ND	ND	ND	ND	ND
38UN86	ND	ND	ND	ND	ND	ND	ND	ND
38UN96	ND	ND	ND	ND	ND	ND	ND	ND
38UN97	.025	1400	ND	ND	ND	ND	3	CIC2

ND - Visibility not adequate to assess data

\* Soil productivity rankings are taken from Camp, et al. 1975

1 = Moderate productivity

2 = Moderately high productivity

3 = High productivity

### *Statistical Tests*

The Spearman rank correlation coefficient ( $r_s$ ) is used to test for independence between two random variables. This statistic compares the overall similarity of two ordinal rankings and is computed by the following formula (Spearman 1904)

$$r_s = 1 - \frac{6 \sum d_i^2}{n(n^2-1)}$$

where  $d_i$  is the raw difference between rankings of variate pair  $i$ , and  $n$  is the total number of such pairings. Siegel (1956) demonstrates the derivation of  $r_s$ .

The first test implication (I), describes the expectation that there is a positive correlation between site density and soil productivity. The proper design for this implication is a one-tailed test for positive correlation where the alternative statistical hypotheses state:

- $H_0$ : Site density and soil productivity are mutually independent.
- $H_1$ : There is a tendency for the larger values of site density and soil productivity to be paired together.

The level of rejection of  $H_0$  or the significance level for this specific test is set at  $\alpha = 0.05$ . The critical value for  $r_s$  at  $\alpha = 0.05$  with  $n = 13$  (the number of paired cases for the first test implication) is found to be  $r_s = .4780$ . Therefore, if the obtained value for  $r_s$  exceeds this critical value we are justified in rejecting the null hypothesis ( $H_0$ ). A second method for testing the significance of  $r_s$  is available when 10 or more pairs are involved (cf. Blalock 1972). In this instance it is assumed that  $n$  approaches normality and can be tested by computing a  $t$ -score:

$$t = \frac{r_s \sqrt{n-2}}{\sqrt{1-r_s^2}}$$

Both tests will be run on the data (Table 3).

TABLE 3

## PAIRED VARIATE DATA LISTING FOR SITE DENSITY AND SOIL PRODUCTIVITY

Site density	Rank order	Soil productivity rating	Rank order	$d_i$	$d_i^2$
.003	1.0	1	3.0	-2.0	4.0
.006	1.5	2	6.5	-5.0	25.0
.006	1.5	1	3.0	-1.5	2.25
.008	4.0	3	10.5	-6.5	42.25
.009	5.0	1	3.0	2.0	4.0
.012	6.0	2	6.5	-0.5	0.25
.017	7.5	3	10.5	-3.0	9.0
.017	7.5	1	3.0	4.5	20.25
.020	9.0	3	10.5	-1.5	2.25
.021	10.0	1	3.0	7.0	49.0
.023	11.0	3	10.5	0.5	0.25
.025	12.0	3	10.5	1.5	2.25
.049	13.0	3	10.5	2.5	6.25

$$\sum d_i^2 = 167$$

Spearman's Rank-order correlation coefficient is calculated by:

$$r_s = 1 - \frac{6(167)}{13(169-1)}$$

$$= +0.5412$$

The critical value for  $r_s$  (0.4780) is exceeded and we are justified in rejecting  $H_0$  at the .05 level of significance.

The first test Implication ( $I_1$ ) is confirmed by this test of significance. The second method of testing involves the calculation of a t-statistic to achieve a normal approximation of  $r_s$ .

$$t = \frac{0.5412 \sqrt{13-2}}{\sqrt{1-0.5412^2}}$$

$$= 2.1346$$

At the 0.05 level of significance with 11 degrees of freedom for a one-tailed test the critical value for  $t_{0.10} = 1.796$ . This value is exceeded by the observed  $t$  statistic for  $r_s$  and, therefore, the result is considered statistically significant.

Although there is a significant positive correlation between site density and soil productivity, close inspection of the paired variate listing indicates that there is a good deal of mixing between the ranks. That is to say, it is not uncommon to find low density sites in high productivity soils and vice versa. Perhaps a better way of conceptualizing the relationship between density and productivity would be to eliminate the site level of measurement all together and concentrate on artifact densities within the calculated areas of soil patches. Schiffer (1975) has recently called for more use of strategies of this sort where measures of density and distribution of cultural elements are emphasized rather than site specific measurements. However, highway corridor surveys often do not permit this type of extensive areal coverage.

The second test implication describes an expected positive correlation between site size and soil productivity. Again, the proper design for this test implication and all other types of positive correlational statements, is a one-tailed test where the alternative statistical hypotheses state:

$H_0$ : Site size and soil productivity are mutually independent.

$H_1$ : There is a tendency for the larger values of site size and soil productivity to be paired together.

The critical value for  $r_s$  at  $\alpha = 0.05$  with  $n = 13$  is found to be  $r_s = 0.4780$ . If the obtained value for  $r_s$  exceeds this critical value  $H_0$  is rejected and we are justified in accepting  $H_1$  (Table 4).

TABLE 4

## PAIRED VARIATE DATA LISTING FOR SITE SIZE AND SOIL PRODUCTIVITY

Site Size (area in square meters)	Rank order	Soil productivity rating	Rank order	$d_i$	$d_i^2$
900	2	2	6.5	-4.5	20.25
900	2	1	3.0	-1.0	1.0
900	2	3	10.5	-8.5	72.25
1400	4	3	10.5	-6.5	42.25
2500	5.5	3	10.5	-5.0	25.0
2500	5.5	2	6.5	-1.0	1.0
3750	8	1	3.0	5.0	25.0
3750	8	1	3.0	5.0	25.0
3750	8	1	3.0	5.0	25.0
4500	10	1	3.0	7.0	49.0
5000	11	3	10.5	0.5	0.25
20,000	12	3	10.5	1.5	2.25
52,500	13	3	10.5	2.5	6.25

$$\sum d_i^2 = 294.5$$

Spearman's Rho is calculated:

$$r_s = 1 - \frac{6 (294.5)}{13(169-1)}$$

$$= +0.1909$$

The obtained value of  $r_s$  is considerably smaller than the critical value  $r_s = 0.4780$ . Therefore, we fail to reject the null hypothesis ( $H_0$ ).

The calculation of a t-statistic for  $r_s$  illustrates this result as well:

$$t = \frac{0.1909 \sqrt{13-2}}{\sqrt{1-0.1909^2}}$$

$$= .6450$$

At the 0.5 level of significance for 11 degrees of freedom for a one-tailed test the critical value for  $t_{0.10} = 1.796$ . The obtained t-value of .6450 falls considerably short of the critical value and therefore we fail to reject the null hypothesis.

Consequently, the second test implication is disconfirmed. The explanation for this result can probably be linked to the preceding discussion of site density. There is no reason to believe that smaller sites should not be found in areas of high productivity. The general relationship that is observed is that large, dense, diverse sites tend to be located in areas of high productivity. For instance, 38UN27,



38UN28 and 38UN54 represent the largest, densest and most diverse sites in the corridor and all are located in rank 3 productivity soils. Thus, a more accurate measure for the areal extent of sites might be a calculation of the area covered by artifactual debris in a soil patch divided by the total area of that soil patch. This would result in a more meaningful comparable property of site/environment relationships. Thus, the failure to reject  $H_0$  for this measurement does not, in actuality, disconfirm the major research hypothesis of this study.

The third implication involves an expected positive correlation between soil productivity and the Tool Diversity Index and the Tool Diversity-Abundance Index (Tables 5 & 6). Again, this implies one-tailed tests where the alternative statistical hypotheses state:

$H_0$  - Both the Site Tool Diversity (TDI) and Site Tool Diversity-Abundance (TDAI) Indices are mutually independent of soil productivity.

$H_1$  - There is a tendency for larger values of both TDI and TDAI to be paired with soil productivity.

The critical value for  $r_s$  at  $\alpha = 0.05$  with  $n = 12$  for this test equals 0.4965.

TABLE 5

THE PAIRED VARIATE LISTING FOR THE TOOL DIVERSITY INDEX AND SOIL PRODUCTIVITY

TDI	Rank order	Soil productivity rating	Rank order	$d_i$	$d_i^2$
.2	3	2	6.5	-3.5	12.25
.2	3	1	3.0	0	0
.2	3	2	6.5	-3.5	12.25
.2	3	1	3.0	0	0
.2	3	1	3.0	0	0
.4	7	1	3.0	4.0	16.0
.4	7	3	10.0	-3.0	9.0
.4	7	3	10.0	-3.0	9.0
.6	10	3	10.0	0	0
.6	10	3	10.0	0	0
.6	10	1	3.0	7.0	49.0
1	12	3	10.0	2.0	4.0

$$\sum d_i^2 = 112$$

Spearman's Rho is calculated:

$$r_s = 1 - \frac{6 (112)}{12(144-1)}$$

$$= +0.6084$$

The obtained value of  $r_s$  is significant at the 0.025 level indicating a strong positive correlation between soil productivity and tool diversity. The obtained t-statistic for  $r_s$  equals 2.4242. At 10 degrees of freedom for a one-tailed test this value is significant at the 0.02 level as well. The null hypothesis is rejected for TDI and soil productivity.

TABLE 6  
THE PAIRED VARIATE LISTING FOR THE TOOL DIVERSITY-  
ABUNDANCE INDEX AND SOIL PRODUCTIVITY

TDAI	Rank order	Soil productivity rating	Rank order	$d_i$	$d_i^2$
.2	1.0	1	3.0	-2.0	4.0
.4	3.0	2	6.5	-3.5	12.25
.4	3.0	1	3.0	0	0
.4	3.0	2	6.5	-3.5	12.25
.6	5.0	1	3.0	2.0	4.0
.8	6.5	3	10.0	-3.5	12.25
.8	6.5	3	10.0	-3.5	12.25
1.2	8.0	1	3.0	5.0	25.0
3.0	9.0	1	3.0	6.0	36.0
3.6	10.0	3	10.0	0	0
5.4	11.0	3	10.0	1.0	1.0
38.0	12.0	3	10.0	2.0	4.0

$$\sum d_i^2 = 124$$

Spearman's Rho is calculated:

$$r_s = 1 - \frac{6(124)}{12(144-1)}$$

$$= +0.5664$$

The obtained value for  $r_s$  is significant at the 0.05 level. Calculation of t-statistic is 2.1733. For 10 degrees of freedom with a one-tailed test  $t_{0.10} = 1.812$ . The obtained value therefore, is significant at the 0.05 level utilizing this testing method as well.

Both tool diversity functions are demonstrated to be significantly correlated in a positive fashion with soil productivity. The obtained  $r_s$  of .6084 for TDI is significant at a high level of probability and indicates an extremely strong relationship between tool diversity and soil productivity. This relationship suggests two opposing explanations.

In the first case, the wide variety of tool types found in high productivity patches might simply result from the greater probabilities of discard of formal tool types in areas of increased use intensity. This model stipulates no significant functional differences in the utilization of both low and high productivity areas. In the second instance, increased tool diversity may point to an association between high productivity patches and maintenance functions. Certainly, the characteristics of 38UN28 and 38UN54 are suggestive of the "less intensive" habitation site category hypothesized by House and Ballenger (1976: 82). In fact, these two sites satisfy all three of the proposed implications for this site category: 1) favorable location, 2) high tool diversity and 3) high artifact densities. Ultimately, the identification of site function in the Piedmont will require the generation of corroborative, independent data sets. This will only come about through controlled excavation plans.

The somewhat lower  $r_s$  value obtained for the Tool Diversity-Abundance Index suggests another possible detailed utilization pattern for the inter-riverine Piedmont. A smaller  $r_s$  value for TDAI would indicate that sites in lower productivity patches, although typified by extremely low tool diversity, were contributing more significantly to the abundance index. This would suggest the repetitive duplication of a limited number of tool categories, a characteristic of functional specialization. To take this concept somewhat further, this duplicative pattern was observed in two tool systems: 1) the biface system and 2) the unifacial flake side scraper system. These two systems become even more interesting when their spatial patterns are observed. The great duplication in the flake side scraper system occurs at 38UN49, 38UN50, 38UN51, 38UN52 and 38UN53. These sites are located on poorly productive (rank 1) soils on a ridge nose adjacent to a permanent or semi-permanent stream. The biface system, on the other hand, appears to be associated with higher locations on ridge tops adjacent to drainage heads. This patterning is strongly suggestive of variation in specialized extractive tasks.

The final two indices are measures of continued occupancy through time. These measures test the expectation that areas of high soil productivity were consistently preferred loci of utilization through time (Table 7). Again, a one-tailed test for positive correlation was used where the alternative statistical hypotheses state:

- $H_0$  - Multi-component Diversity (McDI) and Multi-component Abundance (McAI) both are mutually independent of soil productivity.
- $H_1$  - There is a tendency for the larger values of McDI and McAI both to be paired with larger values of soil productivity. The critical value for  $r_s$  at  $\alpha = 0.05$  with  $n = 12$  equals 0.4965.

TABLE 7  
PAIRED VARIATE DATA LISTING FOR  
MULTI-COMPONENT DIVERSITY INDEX AND SOIL PRODUCTIVITY

McDI	Rank order	Soil productivity rating	Rank order	$d_i$	$d_i^2$
0	3.5	2	6.5	-3.0	9.0
0	3.5	1	3.0	0.5	0.25
0	3.5	1	3.0	0.5	0.25
0	3.5	1	3.0	0.5	0.25
0	3.5	1	3.0	0.5	0.25
0	3.5	1	3.0	0.5	0.25
.143	7.5	3	10.0	-2.5	6.25
.143	7.5	3	10.0	-2.5	6.25
.286	9.5	2	6.5	3.0	9.0
.286	9.5	3	10.0	-0.5	0.25
.571	11.5	3	10.0	1.5	2.25
.571	11.5	3	10.0	1.5	2.25

$$\sum d_i^2 = 36.5$$

Spearman's Rho is calculated:

$$r_s = \frac{1 - 6(36.5)}{12(144 - 1)}$$

$$= +0.8724$$

The obtained value for  $r_s$  is significant at the .001 level. The corresponding t-statistic is equally strong,  $t = 5.6441$  or significant at the .001 level. We are justified in rejecting the null hypothesis ( $H_0$ ).

The extremely strong positive correlation between McDI and soil productivity is principally the result of the input of two sites: 38UN28 and 38UN54. 38UN28 contains components from a wide array of culture-historic periods including the Early, Middle and Late Archaic and the Woodland periods. The surface collection from 38UN54 lacks Early Archaic, but is characterized by a heavy concentration consisting of Morrow Mountain I and II and Guilford components of Middle Archaic occupation. At least one Woodland component is also present. The computation of a Spearman's Rho value for McAI is not appreciably different from the  $r_s$  value for McDI and as such is not reported herein. The strong correlation found in this data property adds credence to the claims that soil strongly conditions primary productivity and has remained fairly stable in its distribution in the Piedmont throughout the Holocene. It appears, then that the phenomenon of multicomponency is closely tied to general productivity and that the differential productivity distribution is accurately reflected by soil type.

### Conclusion

Three of the four test implications of the major research hypothesis of the U.S. 176 By-pass survey were confirmed. The failure to reject the null hypothesis in the case of site size was not considered a major obstacle in the confirmation of the hypothesis that the intensity of utilization of the inter-riverine Piedmont is positively correlated with productivity as it is reflected by soils. Indeed, the research findings of this report lend strong support to this hypothesis.

In the process of testing the implications of the hypothesis a number of patterns related to more detailed aspects of inter-riverine Piedmont utilization were suggested. These recognized patterns will form the basis for discussing the scientific importance of sites in the next section.

*IMPORTANCE OF THE ARCHEOLOGICAL RESOURCES  
WITHIN THE PROPOSED U.S. 176 BY-PASS ROUTE*

Six of the sites found during survey were identified as containing important information for on-going scientific research in South Carolina. These sites contain information categories that would best be conserved by controlled, systematic data recovery techniques. The following discussion will present the rationale for this opinion.

The preceding study, as was indicated, identified several information categories that should be investigated at several of the sites within the corridor. First, there is the issue of the identification of site functional patterning. This category corresponds to Goodyear's (1978) category of substantive significance. One aspect of functional patterning that should be examined concerns the nature of specialized extractive activities. Two forms of activity of this sort have been tentatively recognized in the U.S. 176 By-pass corridor. The first relates to the unifacial flake side scraper tool system observed at 38UN49, 38UN50, 38UN51, 38UN52 and 38UN53. Of these five sites, 38UN49, 38UN50 and 38UN51 are preserved well enough to yield data adequate to site function identification. Thus, 38UN49, 38UN50 and 38UN51 are considered extremely important for informing on this category of information.

The second form of specialized activity is identified by the limited biface tool system. This system is visible at 38UN22, 38UN23, 38UN24, 38UN25, 38UN26, 38UN27, 38UN29 and 38UN30. Of the sites, only 38UN27 can be considered adequately preserved to inform on this research category. Thus, 38UN27 is also considered important in informing on the role of projectile points and other biface categories in specialized extractive tasks.

A final functional category corresponds to maintenance activities. Two sites, 38UN28 and 38UN54, are pertinent to this category and, because each is well preserved, both of these sites are considered important for the reconstruction of total subsistence settlement patterns in the inter-riverine Piedmont.

38UN54, 38UN28 and 38UN27 are also considered invaluable for providing information of an Anthropological Significance (see Goodyear 1978). 38UN54 is a massive site typified by almost exclusive Middle Archaic occupation. In this respect, the site is unique as this pattern has not been observed during previous research conducted by the Institute of Archeology and Anthropology in the inter-riverine Piedmont. A scientifically controlled investigation of this site would be immensely informative about the nature of Middle Archaic adaptive strategies in the inter-riverine Piedmont. The presence of deep deposits in one section of 38UN54, makes it an even more important locus for further scientific research. The presence of prehistoric ceramic sherds makes 38UN27 and 38UN28 exceedingly interesting for their potential in informing on the adaptive advantages of facilities in coping with the inter-riverine

environment. Lastly, the occurrence of an Early Archaic Palmer point at 38UN28 makes this site a unique or rare locus in the highly dissected ridge finger environmental section of the inter-riverine Piedmont. In this respect, the site contains potential for the study of changing patterns of settlement during the Early Archaic period.

In summary, six sites in the U.S. 176 By-pass corridor are considered important for the building of scientific knowledge concerning the prehistory of South Carolina. These sites are 38UN27, 38UN28, 38UN49, 38UN50, 38UN51 and 38UN54. These sites contain information of scientific importance and it is suggested that their values can best be realized either by avoiding them by re-planning the route of the highway or by systematically excavating portions of them.

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APPENDIX I - ARTIFACT TABULATIONS

Prehistoric Material

Site Number	Raw Material	Chunks	Other flakes	Thinning flakes	Flake Core	Projectile Points					Pre-forms	Other bifaces and frags.	Unifaces			Ceramics (sherds)
						Palmer	Morrow Mtn. I	Morrow Mtn. II	Guilford	Savannah River	Yadkin	Woodland Stemmed				
38UN22	Quartz	4	2	16									2			
38UN23	Quartz		1	6									2			
	Slate			2												
38UN24	Quartz	1		2				1	1							
38UN25	Quartz	3		5							1		1	2		
	Slate			3												
38UN26	Quartz	3		1									1			
38UN27	Quartz	25	13	37	2				1				2	2		1 highly eroded, heterogeneous, coarse sand temper
	Slate			1						1						
38UN28	Quartz	13		35	1	1			2	1	1		1	3		2 heavily eroded, coarse sand temper
	Schist			1												
38UN29	Quartz	5		6							1		1			
	Rhyolite			1												
38UN30	Quartz	2		7				1					1			
38UN31	Quartz	9		6												
38UN33	Quartz	9		6												
	Slate	2														
38UN49	Quartz	10		9												
38UN50	Quartz	6		3									1			
38UN51	Quartz	11	3	31										3		
38UN52	Quartz	21	5	21									1	3	1	
38UN53	Quartz	1	3	2										1		
	Slate			1												
38UN54	Quartz	55	1	55									5			
	Slate			5												
38UN55	Quartz	13		6												
38UN56	Quartz	15	1	11												
	Rhyolite	1		1												
	Schist	1		1												
38UN57	Quartz	295	17	304	1		1	1	1				4	1	1	
	Rhyolite		1	11									1	1	1	
	Slate			4												
	Schist	1		1												
38UN85	Quartz			2												
38UN86	Quartz	1		2												
38UN96	Quartz			2												
38UN97	Quartz	10	1	10												

# HISTORIC MATERIAL

38UN28

Quantity	Description
3	Milk glass
1	Milk glass mason jar lid
1	Wine glass fragment
1	Brown glass fragment
1	Clear glass bottle neck
1	Clear glass bottle fragment
1	White porcelain doll arm
1	White porcelain tea cup fragment with transfer printed overglazed floral design
4	Ironstone white ware with transfer printed overglazed floral design
15	Ironstone white ware with transfer printed overglazed floral design
1	Pearlware
1	Blue shell edged pearlware
1	Green shell edged pearlware
2	Blue bordered ironstone white ware
1	Brown bordered ironstone white ware
5	Feldspathic glazed earthenware
11	Feldspathic glazed earthenware with Albany slip interior
8	Albany slip interior/exterior earthenware